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# NATIONAL REPORT SUBMITTED BY

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## Introduction

Sierra Leone is a small country with an area of 72,500 square kilometres and an approximate population of 3.3 million.

The increases in the prices of imported petroleum products since 1974 have had a crippling effect on the economy of the country.

It is essential for the future that efforts are made to economise on the use of petroleum and to develop new and renewable sources of energy.

In Sierra Leone at present the main sources of energy are petroleum products, electricity (generated using oil) fuelwood and charcoal.

The 1980 imports of crude oil amounted to about 230,000 tons which cost Le72 million representing 20% of the estimated national income or 30% of the foreign exchange budget. Indications are that the prices of oil will continue to escalate and the effect on the national budget will become even more serious.

The installed capacity of electricity generating plants in Sierra Leone is 57.7 MW of which 44.5 MW is in the Freetown area. From April 79 to March 1980 the total electric power sold was 94,746,000 Kwh.

Fuelwood and charcoal are the main sources of energy for cooking throughout the country. The total consumption for Sierra Leone has been estimated as 2.5 million cubic metres per year of which 250,000 is supplied to Freetown. The main sources are younger trees in protected forests and forest reserves and this exploitation poses an ecological problem which also must be solved. However the use of firewood will continue as the main energy source in rural areas for a considerable time.

Hydro power remains generally untapped with only one small plant of 2.4 MW at the Guma Water Supply Dam on the Freetown Penisular. A second plant of 4.0 MW installed capacity is scheduled for construction at Goma, 20 miles north of Kenema.

Energy production from forest waste is being undertaken at the Forest Industries Corporation at Kenema where sawdust and wood waste is being utilised.

The generation of electricity its distribution and sale come under the direction of the Ministry of Energy and Power through the agency of the Sierra Leone Electricity Corporation.
However there are a number of generation plants throughout the country which are run by private or parastatal organisations primarily involved in mining operations. These come under the control of the Ministry of Mines.

The Ministry of Agriculture and Forestry controls the sources of fuelwood.

## II. Proposed future action on control of new and renewable energy sources

A national energy committee has been formed. The first action required in Sierra Leone is to define a national energy to determine national energy policy to coordinate activities within this sector and to create a controlling body to implement the policy decisions

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Policy matters will be laid down to cover matters such as:-

Conservation of energy use

Control of basic sources

Priorities in use of basic sources

Size of development expenditure

Cooperation regionally and nationally

III. Role of present, new and renewable sources of energy

The role of various energy sources and their forseen future direction is given below -

Oil and Petroleum products

At the moment oil dominates the energy scene in Sierra Leone and plays a controlling part in the economy.

Oil is the energy base for electricity production and transportation. The main effort to improving the economy of the country will be directed towards developing alternative means of producing electricity (hydropower) and making economies in the use of petroleum products as a fuel for transportation.

The development of hydropower is dealt with below:

Economies in transportation can be achieved by the following means:-

* improved road alignments and surfaces
* more economical vehicles
* a change to more fuel efficient means of transport (water transport).

Another step towards economy which should be investigated is the use of more economical vehicles.

A further avenue which could make economies in bulk transportation is greater use of rivers, estuaries and coastal waters for water transportation. This highly efficient method of moving heavy loads is not properly exploited at present and deserves closer investigation.

Hydropower

The total hydroelectric potential of Sierra Leone rivers has been estimated at about 2000 megawatts. This is approximately 100 times the present installed capacity of oil powered generating units.

While it is doubtful that the above potential could ever be realised it is conceivable that a figure of 1100 Megawatts could be harnessed.

As a first step towards the development of hydropower in Sierra Leone the construction of Bumbuna Scheme on the Seli River will commence in 1982 and the first phase with an installed capacity of 60.0 MW will come onto stream in 1986.

Further phases in this scheme will be constructed as required and will have a total installed capacity of 305MW. This finalised scheme has been planned to supply the majority of the country's needs up to 2030.

In addition to this scheme the Kongo Scheme on the Mano River is now being designed. This could supply 75 MW of power to Sierra Leone when completed.

To supply power efficiently to the rural areas where the cost of transmission from the major schemes would be too high it is proposed to develop small scale hydro-schemes at Kabala, Dodo, Gandorhun and Moyamba.

The major and small scale schemes will be progressively connected so that a national electric power grid is developed and distribution can be effected to all large villages in the country.

Biomass

In Sierra Leone as in most other developing countries in Africa fuelwood and charcoal are the main source of energy for the majority of the population. This source of energy will continue to be dominant for a long time.

Efforts being made by the Government to maintain the source and control are primarily centred in forestry projects supported by bi-lateral and multilateral aid.

These projects will concentrate on reforestation, production of fuelwood and charcoal, manufacture and distribution of efficient stoves, training of forestry and wood industry personnel, reorganising forest policy and organisation.

In addition effects will be made in the various Integrated Agricultural Development Projects to establish village wood lots where quick growing trees will be planted to provide fuelwood for the immediately adjacent areas.

More efficient charcoal manufacture will be developed to maximise the energy obtained from this source.

Little use is being made of agricultural wastes to produce energy in Sierra Leone although sawdust and wood waste is being used to fuel the Forest Industries Corporation's factory in Kenema and palm kernels shells have been used to fuel boilers in some oil palm factories.

The use of agricultural wastes need to be further developed especially using rice husks, palm kernel shells, cocoa pods and bagasse.

A new sugar cane project has been started with bi-lateral assistance and there will be an output of alcohol from this project which could be directed towards use as a fuel supplement. Further research is required into the production of alcohol from special crops such as sugar cane and cassava. Development of such cash crops would have the double benefit of energy substitution and income for rural producers.

When consideration is being given to the use of agricultural wastes it must be remembered that transport costs can make proposals uneconomic. Schemes therefore should aim at using wastes where they are produced.

Biogas

The production of biogas in Sierra Leone appears to limited application. In countries where biogas is well developed the main ingredient is animal manure and in Sierra Leone the raising of animals

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is not widespread. In areas where animals are raised the herders lead a semi-nomadic life and once again this mitigates against the establishment of biogas generators. It is possible that customs may be changed by the production of biogas energy and the fertilizer by product but a long time would be required for such a change.

Studies should be made preferably by local universities and consultants to determine what biomass sources are available for biogas production. These studies should also determine how receptive rural communities would be to the production and use of biogas.

Solar Energy

This source of energy is in the process of being developed.

Future uses are envisaged as water heating in domestic and commercial (hotels) enviroment and drying of some crops, fish and meat. These uses require studies and are only likely to be applicable in outlets which have adequate finance because of the high initial cost.

The use of solar power could be limited in Sierra Leone by adverse atmospheric conditions over a large part of the year (cloud and harmattan dust).

One application which will bear further studies is the use of photovoltaic methods to power isolated communications installations. This could be in marine and inland locations where access is limited.

The university is carrying out research into the use of solar energy and the work being carried out could well be intensified by government and multi-lateral assistance.

Wind

Wind energy is not exploited at the moment. Some areas of Sierra Leone could however well use this form of energy especially for duties such as pumping water and providing electricity for charging batteries for lighting.

The production of salt in ponds adjacent to the sea is under consideration and here wind power for elevating the water beyond the tidal range could prove most applicable.

A detailed study is required to determine the potential of wind power throughout the country.

Lignite

Deposits of lignite were discovered near Freetown and are overlain with clay and in the past clay bricks have been manufactured using the clay as the brick material and the underlying lignite as the fuel for burning.

Investigations are being carried out to determine whether the lignite could be successfully mined and used as a fuel to produce electricity in a steam powered generating station to reduce dependence on oil.

IV. Constraints and Remedies

The constraints to the development of new and alternative sources of energy with suggested action to remove them are -

| Constraint | Remedies |
|---|---|
| Lack of national energy policy. | Formulation of national energy policy with due consideration to sectorial priorities. |
| Lack of data on various energy sources. | Commission existing personnel in ministries, universities and other bodies to gather information. |
| Lack of studies to guide decision makers on costs and benefits of various energy sources. | Commission consultants to prepare studies. Local university and consulting personnel are competent for most studies. |
| Lack of funds for studies and pilot schemes | Request funds from bilateral and multilateral sources. |
| Lack of technical skill and experience at certain level | Include study of energy conservation and development in technical education course at all levels |
| Lack of Energy management skills | Training and exposure to energy management both locally and foreign |
| Lack of general knowledge on energy conservation and use. | Use television and radio to spread knowledge to general public. |

Cooperation in Development of New and Renewable Energy Sources

First at national level all available data must be collected a an inventory prepared to national sources of energy and capability develope.

Second selected technical people must be given the opportunity to expand their knowledge of the various forms of energy which can be developed in Sierra Leone.

Third technical representatives should be sent to regional conferences and world-wide conferences which will discuss the devel ment of new energy sources.

Finally permanent contact should be maintained by the nationa energy committee with regional and international bodies dealing with energy development.

This committee should advise Government on all matters related to energy so that decisions are made and funds are provided to support energy development.

VI. Conclusion

The Government of Sierra Leone recognises the importance of controlling the use of energy.

It realises that renewable energy sources are of paramount importance to its future economy and is interested in the developme of new and renewable energy forms.

It intends to participate in regional and international eff to develop new sources of energy.

It is seeking assistance in the development first of hydroelectric power since this is its most abundant source of energy

It has embarked on a major Forestry project which would develop the production of firewood for fuel.

Investigations are being carried out into other forms of energy applicable to Sierra Leone.